REMARKS

I. Summary of Office Action

Claims 1-53 are pending in the above-identified application.

Claims 1-53 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

Claims 1-6, 8-21, 23-35, 38-45, 48-49, 51, and 53 were rejected under 35 U.S.C. § 102(a) as being anticipated by "A Maximum Likelihood Approach to Single-Source Channel Separation", Jang et al (hereafter "Jang").

Claims 7, 22, 36, 37, 46, 47, 50, and 52 were objected to as being dependent upon a rejected based claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims Applicants respectfully traverse each rejection.

II. Applicants' Reply to the § 102(a) Claim Rejections

A. Independent Claims 1 and 15

The Examiner rejected independent claims 1 and 15 under 35 U.S.C. § 102(a) as being anticipated by Jang. The Examiner's rejection is respectfully traversed.

Independent claims 1 and 15 relate to a method and system for performing source separation. A composite signal which includes a plurality of sources is received. Each source is characterized by at least one filtered basis function and at least one coefficient. A post-filter signal dictionary is provided. The post-filter signal dictionary includes a set of filtered basis functions, of which at least a portion form part of each source that is included in the dictionary. The value of at least one coefficient of each source is estimated using the composite signal and the dictionary. At least one source is reconstructed using the estimated value of the coefficients.

Jang relates to a technique for achieving blind signal separation when given only a single channel recording. Continuous samples of a specified length are chopped out of a

source, and are represented as a linear combination of basis functions. An independent component analysis (ICA) learning algorithm then adapts a set of basis filters using a generalized formulation of an ICA cost function. Estimates of the source signal are passed through the set of basis filters, generating sparse codes. The stochastic gradient for each code is computed. The gradient for each code is transformed to the domain of the source signal. The individual gradients, or differences, are combined and modified to satisfy given constraints, and added to the current estimates of the source signals.

Jang does not teach each and every claimed limitation as specified in applicants' independent claims 1 and 15. Specifically, Jang does not teach providing or accessing a post-filter signal dictionary that includes a set of filtered basis functions, wherein at least a portion of the filtered basis functions that form part of <u>each source</u> is included.

In contrast with applicants' approach of providing a single dictionary containing filtered basis functions of which at least a portion form part of each source(see box 335 of

FIG. 3 of applicants' specification), Jang uses a different dictionary for each source. This distinction is apparent from the way that Jang constructs the rows of W, the matrix of basis filters that is used to generate the codes which are used to refine Jang's estimates of the source signals. In section 2.2, Jang states that "To learn the basis filters for the i^{th} source, only $\{s_i^t | t \in [1,T]\}$ are used." In other words, to learn the basis filter for the i^{th} source, only the weight vector for the i^{th} source is used. Jang constructs *n* sets of basis filters $W_1, W_2, \cdots W_n$, where *n* is the number of sources that are to be separated. Each set of basis filters $W_1, W_2, \cdots W_n$ for the i^{th} source is then separately applied to the estimate of the i^{th} source signal $\hat{x}_1^t, \hat{x}_2^t, \cdots \hat{x}_n^t$ (see Jang, page 1376, step A of Figure 4). Thus, Jang creates a separate dictionary for each source which contains filtered basis functions for only that source. Jang does not show providing or accessing a post-filter signal dictionary that includes a set of filtered basis functions, wherein at least a portion of the filtered basis functions that form part of <u>each source</u> is included as required by applicants' independent claim 1.

Even if Jang did provide a post-filter source dictionary which included at least a portion of the filtered basis functions that form part of each source, which Jang does not, such a signal dictionary would be useless in Jang's overall structure and data flow. As demonstrated in Figure 4 of Jang, each separate signal dictionary, or set of codes, is designed to be statistically independent. The stochastic gradient for each code is computed from the derivative of the log likelihood for each individual code. These gradients are then used to adjust the estimates of the source signals. If Jang applied a post-filter signal dictionary such as that specified in applicants' independent claims 1 and 15 to the source signal estimates, the resulting codes would not necessarily be statistically independent. This would alter Jang's calculation of the statistic gradients, and thus potentially ruin the accuracy of the source signal gradients which are added back to the source estimates.

For at least the above reasons, Jang fails to show or suggest all of the feature of applicants' independent claim 1. Applicants respectfully submit that the rejection of independent claim 1 should be withdrawn. The rejection of

independent claim 15 should also be withdrawn for at least the same reasons.

B. Independent Claims 28 and 39

Independent claims 28 and 39 relate to a method and a system for performing source separation. A signal dictionary is generated through the application of at least one directional filter. A mixture of sources including desired sources and undesired sources is received. The sources are separated using elements of the signal dictionary and the mixture of sources as variables in a set of mathematical equations that estimate the value of unknown coefficients corresponding to each of the sources.

Jang relates to a technique for achieving blind signal separation when given only a single channel recording. Sets of basis filters are adapted for each source using a generalized formulation of an ICA cost function, which uses a learning algorithm called the ICA learning rule. Current estimates of each source signal are passed through a corresponding set of basis filters. Stochastic gradients are calculated from the result, transformed into the domain of the

source signal, combined and modified to satisfy a set of given constraints, and added to the current estimates of the source signals.

Jang does not teach each and every claimed limitation as specified in applicants' independent claims 28 and 39. Specifically, Jang does not teach generating a signal dictionary through application of at least one directional filter.

Applicants' approach to performing source separation as required by independent claims 28 and 39 uses directional filters. In general, directional filters modify a source according to its position to generate a filtered source. An advantage of directional filters is that they can be used to incorporate factors of a source's environment, reverberations, distortion, echoes, delays, frequency -dependent attenuation, and the location of the source. Using these directional filters, the present invention generates a signal dictionary that hypothesizes how each source will be received by a sensor after the source has undergone a transformation.

In contrast with applicants' approach as required by independent claims 28 and 39, Jang uses a set of filters using

independent component analysis (ICA). ICA is a known computational method for separating a multivariate signal into additive subcomponents supposing mutual statistical independence of non-Gaussian source signals. ICA algorithms estimate the inverse-translation-operator that maps observed mixtures to the original sources. ICA algorithms perform best when the number of observed signals is greater than or equal to the number of sources (see Jang, section 1).

Most importantly, ICA does not take into account the directionality of the source signals. The filters used for source separation in Jang learned using ICA do not take into account the directionality of the source signals. Thus, Jang does not teach generating a signal dictionary through application of at least one directional filter as required by applicants' independent claim 28.

For at least the above reasons, Jang fails to show or suggest all of the features of applicants' independent claims 28 and 39. Applicants respectfully submit that the rejection of independent claim 28 and 39 should be withdrawn.

C. Independent Claims 49 and 51

Independent claims 49 and 51 relate to a method for generating a signal dictionary. A pre-filter signal dictionary which has basis functions and at least one directional filter is provided. A post-filter signal dictionary is then generated by applying the directional filter or filters to each basis function in said pre-filter dictionary. The post-filter signal dictionary thus has filtered basis functions.

As described above with respect to independent claims 28 and 39, the filters used for source separation in Jang are learned using ICA. They do not take into account the directionality of the source signals. Thus, Jang does not provide a method for generating a signal dictionary providing at least one directional filter.

For at least the above reasons, Jang fails to show or suggest all of the feature of applicants' independent claims 49 and 51. Applicants respectfully submit that the rejection of independent claims 49 and 51 should be withdrawn.

D. Dependent Claims

Claims 2-14, 16-27, 29-38, 40-47, and 49-50 depend on independent claims 1, 15, 28, 39, 48, and 51 and are allowable at least because claims 1, 15, 28, 39, 48, and 51 are allowable.

II. Applicants' Reply to the § 101 Claim Rejections

The Examiner rejected claims 1-53 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. The Examiner's rejection is respectfully traversed.

The Examiner rejected claims 1-53 under 35 U.S.C. § 101 because, the Examiner alleged, "the methods/system claims do not produce a tangible result." The Examiner then requested that "claim language be added that includes displaying, storing, or conveying used in tangible results." See page 2 of the Office Action.

Applicants assert that the Examiner is obligated to explain why the claims fall outside of all the statutory

categories of patentable subject matter. See 1300 Off. Gaz. Pat. & Trademark Office 142 (November 22, 2005) (§ IV(B)). While concreteness and tangibility are elements of a patentability standard (see 1 Donald S. Chisum, Chisum on Patents § 1.03[6][j], at 1-327, (2006)), the Examiner has merely concluded, without support, that claims 1-53 do not meet the standard. The Examiner, therefore, has not alleged *prima facie* statutory unpatentability under 35 U.S.C. § 101. For at least this reason, the rejection under 35 U.S.C. § 101 should be withdrawn.

The reasoning underlying the Examiner's conclusion that tangibility requires "language [...] that includes displaying, storing, or conveying" is not clear to applicants." To the extent that the Examiner's reasoning involves the judicially established rule, based on 35 U.S.C. § 101, that a claimed invention have a practical application (see 1300 Off. Gaz. Pat. & Trademark Office 142 (November 22, 2005) (§§ IV(C)(1) and (2)), applicants note that inclusion of a display or storage may be sufficient, but is not necessary, to satisfy the rule. See MPEP § 2106(II)(A) (setting forth illustrative examples of claimed inventions,

several of which do not involve data display, output or storage, that are deemed to satisfy the practical applicability requirement). For at least this reason, the rejection under 35 U.S.C. § 101 should be withdrawn.

III. Applicants' Reply to the Objected Claims

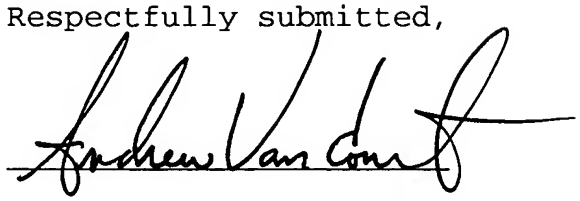
Claims 7, 22, 36, 37, 46, 47, 50, and 52 were objected to as being dependent upon a rejected base claim, but the Examiner states that the claims "would be allowable if rewritten in independent form." See Office Action, page 15. Applicants have amended claims 7, 22, 37, 47, 50, and 52 to be in independent form. For at least this reason, applicant respectfully submits that the objection of claims 7, 22, 36, 37, 46, and 47 be withdrawn.

IV. Conclusion

For at least the foregoing reasons, applicant respectfully submits that this application is in condition for allowance.

Accordingly, prompt reconsideration and allowance of this application are respectfully requested.

Respectfully submitted,



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